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MEMORANDUM

TO: Town of Munster

FROM: Josh Woller, PE (WI, IL, IN)
Mitch Wagner, PE (CO)
Gabrielle Renner, PE (CO), PTOE, RSP1

DATE: February 26, 2025

RE: Calumet Avenue Traffic Signal Coordination, Munster, IN

PURPOSE AND RECOMMENDATION

SEH was tasked by the Town of Munster to develop signal timing plans for the Calumet Ave corridor from River Dr to Main St. Four distinct signal timing plans were developed for implementation:

1. Morning Peak Period – 130 second coordinated cycle length
2. Midday Peak Period – 120 second coordinated cycle length
3. Evening Peak Period – 120 second coordinated cycle length
4. Off Peak – Free Mode

A Saturday and Sunday Peak Period timing is also recommended; however, weekend turning movement counts were not collected as part of the data collection. It is recommended that the Saturday and Sunday Peak Period use the Midday Peak Period timing plan in the interim with field adjustments as necessary.

EXISTING CONDITIONS

Calumet Ave is a major 4-lane north/south arterial roadway in Munster and serves commercial and residential traffic. The study corridor is approximately 3.5 miles long and consists of 14 signalized intersections from River Drive to the north and Main Street to the south. The posted speed limit is 35 miles per hour (mph) along Calumet Ave and Turning movement counts were collected at the 14 intersections on September 11, 2024, during the morning, midday, and evening peak hours. **Figure 1** displays the study corridor limits.

SEH conducted field visits to document roadway geometry to assist in developing proposed base signal timing inputs. The Town provided SEH with base timing signal timing inputs that included a mixture of coordinated and uncoordinated timing plans along the corridor. The data was then entered into Syncho 11 to develop the base existing condition models for the AM, Midday, and PM peak hours.

From the signal timing information provided by the Town of Munster, only eight of the current signalized intersections along the study corridor run a coordinated operation. The uncoordinated intersections appear to run in free mode using the maximum green time (MAX 1) as the split. The list of currently uncoordinated signals includes:

- River Drive
- Community Park Drive
- Fisher Street
- Maple Leaf
- Treadway Road
- Main Street

The intersection at Ridge Road has an offset of zero and was used as the master intersection.

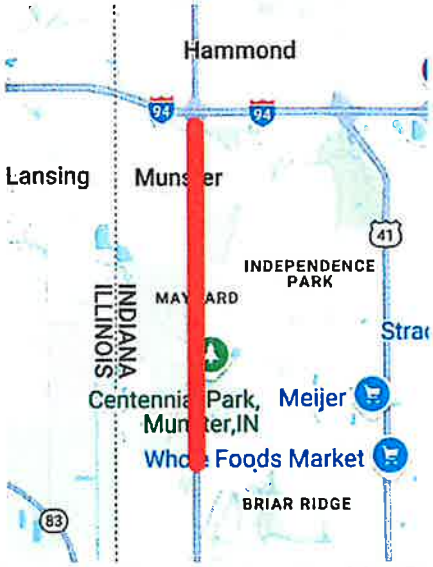

Figure 1. Calumet Ave Signal Timing Corridor Project Limits

UPDATED BASE SIGNAL TIMING INPUTS

Update base signal timing inputs were updated based on the Manual on Uniform Traffic Control Devices (MUTCD) and other typical guidelines normally used for timing inputs. The guidelines are included as an attachment to this memo. The inputs updated include: Minimum Green, Yellow Clearance Interval, All Red Walk and Pedestrian Clearance Interval, Maximum Green, Walk, and Pedestrian Clearance Interval. Vehicle Extension, Time Before Red, Time To Red, and Minimum Gap were not updated from the existing signal timing inputs that the Town of Munster provided SEH. The base signal timing inputs are also included as an attachment to the memo.

PROPOSED CYCLE LENGTH

The Existing Conditions model was used as the background condition for the proposed cycle length models. Four different scenarios, AM Peak Hour, Midday Peak Hour, PM Peak Hour, and Off Peak were created to analyze cycle lengths with the updated base signal inputs included in each scenario. As-built information was not provided to SEH to confirm detectors and capabilities of the traffic signal controller for each intersection; however, through field visits, SEH confirmed that roadway approaches had in-ground detectors. It is assumed that each intersection can run an actuated signal for each approach.

Cycle length optimization and offset optimization was performed in Synchro for each scenario. The results of the cycle length

1. Morning Peak Period – 130 second coordinated cycle length
2. Midday Peak Period – 120 second coordinated cycle length

3. Evening Peak Period – 120 second coordinated cycle length
4. Off Peak – Free Mode – 70-110 second uncoordinated cycle lengths (based on max green)

The proposed signal timings include fully actuated-coordinated signals along the entire corridor with the reference phase being the northbound and southbound through movement. The existing cycle length for the coordinated signals in the morning peak period was 100 seconds and 110 seconds in the midday and evening peak period. The longer proposed cycle length accommodates the longer pedestrian clearance interval included at most intersections. Synchro signal timing outputs are included as an attachment.

TIME OF DAY IMPLEMTATION

Indiana Department of Transportation's (INDOT) Traffic Count Database System (TCDS) was utilized to develop time of day implementation intervals for each of the four timing scenarios. **Figure 2** displays the daily volume counts taken on Wednesday, July 24, 2024, along Calumet Ave just north of River Dr. This location was the only location along the study corridor that displayed a daily volume count.

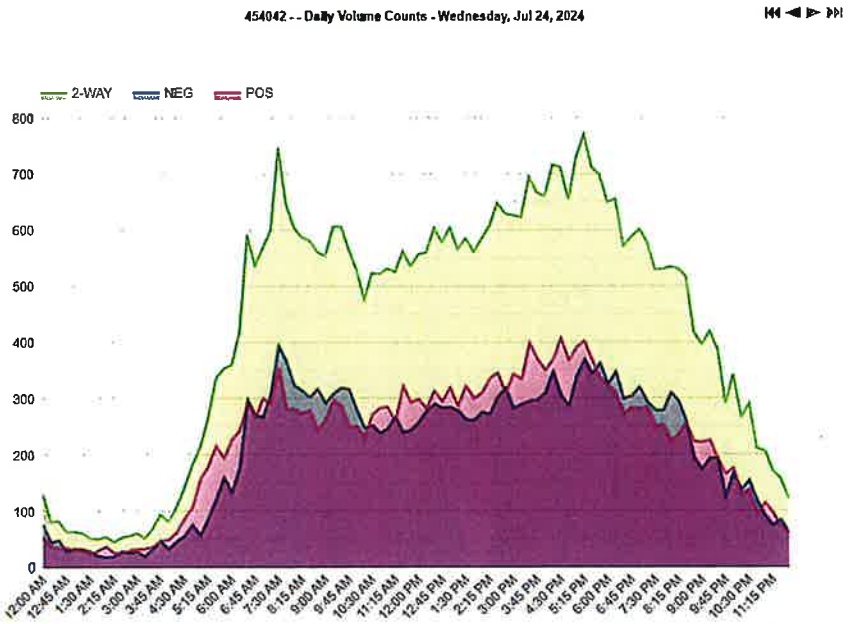

Figure 2. Daily Volume Count - Wednesday, July 24, 2024, on Calumet Ave North of River Dr

The volume distribution displays distinct AM and PM peak periods with a gradual rise in volume from mid-morning through the PM peak period. **Table 1** displays the proposed time of day implementation to align with the traffic volume splits distribution. Off peak was analyzed and performed sufficiently at approximately 67% of the midday peak hour volume. 67% of the off-peak total volume corresponds to approximately 9:00 PM on the traffic distribution chart in **Figure 2.**

Table 1 - Proposed Time of Day Implementation

Weekday Timing Period			
AM Peak Period	Midday Peak Period	PM Peak Period	Off Peak
6:00 AM – 10:00 AM	10:00 AM – 2:00 PM	2:00 PM – 9:00 PM	9:00 PM -6:00 AM

Weekend Peak Period timing is also recommended; however, turning movement counts were not collected as part of the data collection. According to the TCDS the nearest continuous count station that lists Saturday and Sunday counts is located along I-94 just east of Calumet Ave. The distribution of traffic

lists the most volume between 10:00 AM and 6:00 PM. It is recommended that the Saturday and Sunday Peak Period use the Midday Peak Period timing plan in the interim with field adjustments as necessary.

PROPOSED SIGNAL TIMING MEASURES OF EFFECTIVENESS AND IMPLEMENTATION

SimTraffic microsimulation software was used to simulate the existing conditions and proposed signal timings in each scenario. Each scenario simulation was conducted for an hour and included five different runs. The Existing Conditions and Proposed Signal Timing SimTraffic results are included in displayed in **Table 2.**

Table 2 - SimTraffic Results

MOE's	Existing Conditions (NB/SB)			Proposed Signal Timing			
	AM	Midday	PM	AM	Midday	PM	Off Peak
Delay (s/veh)	3818/819	2890/1736	3792/1888	173/174	164/146	243/219	138/128
Travel Time (s)	4525/1187	3631/2151	4828/2337	610/544	600/522	679/593	572/504
Arterial Speed (mph)	4/11	5/6	4/6	26/25	26/26	23/23	28/27
Total Delay/veh (s)	641	576	680	77	69	99	523
Avg Speed (mph)	5	6	5	23	23	20	25

The corridor is projected to see a vast improvement over the existing conditions. Travel time is projected to be drastically improved by several minutes along the corridor in all scenarios. Additionally, the reduction in travel time leads to a sharp increase in average travel speed by nearly 20 mph in the northbound and southbound directions.

ADDITIONAL PROPOSED SIGNAL TIMING ANALYSIS

The proposed signal timing plans suggested for implementation include the pedestrian intervals for all phases that currently serve pedestrians. For a low pedestrian corridor, eliminating the pedestrian interval can help prioritize vehicular traffic movement when developing a coordinated signal timing.

According to the traffic count data supplied to SEH, the pedestrian counts are generally low or zero for most intersections in the AM, Midday, and PM peak hours. Therefore, additional scenarios were developed that eliminated all pedestrian intervals from the overall signal timings of each intersection. The same workflow was applied to the scenarios including optimizing cycle length and offsets. The following coordinated cycle lengths are as follows:

1. Morning Peak Period – 90 second coordinated cycle length
2. Midday Peak Period – 100 second coordinated cycle length
3. Evening Peak Period – 110 second coordinated cycle length

The SimTraffc results are displayed in **Table 3.** The results indicate that the northbound and southbound movements can be even more efficiently moved through the corridor by eliminating the pedestrian signal timing from the overall timing.

Table 3 - SimTraffic Results No Pedestrian Interval

MOE's	Proposed No Peds Conditions (NB/SB)		
	AM	Midday	PM
Delay (s/veh)	146/130	139/123	201/186
Travel Time (s)	584/501	575/499	637/559
Arterial Speed (mph)	27/27	27/27	25/24
Total Delay/veh (s)	82	61	102
Avg Speed (mph)	22	24	20

SHORT / LONG TERM CORRIDOR RECOMMENDATIONS

Based on the existing system analysis the following short term corridor recommendations should be considered:

- Install updated base signal timing parameters into all traffic signal cabinets.
- Install coordinated signal timing plans into all traffic signal cabinets.
- Field verity / fine-tune proposed signal timings after installation.

In addition, the following long-term recommendations should also be considered:

- Lengthen turn lanes based on the findings of the turn lane evaluation attachment
- Evaluate the feasibility of installing 4-section flashing yellow arrow heads to all intersections with existing left turn phasing.

Attachments:
Calumet Ave Base Signal Timing Information
SE Region Timing Guidelines
Proposed Signal Timing Outputs
SimTraffic Outputs
Turn Lane Evaluation